Childhood abuse and late-life depression

Wielaard, I.

2018

document version
Publisher's PDF, also known as Version of record

5

The role of depression, chronic somatic diseases and lifestyle factors in the association between childhood abuse and functional disabilities in older adults

Ilse Wielaard, Max L. Stek, Hannie C. Comijs, Didi Rhebergen

Submitted for publication

Abstract

Introduction: Childhood abuse is associated with functional disabilities in daily life in younger adults. The question is whether this is also true for older adults, and which factors mediate this association. Our purpose is to investigate the association between childhood abuse and functional disabilities in older adults, and whether depression, chronic somatic diseases and life style factors mediate this association. **Methods:** Cross-sectional data were derived from the Netherlands Study of Depression in Older Persons, including 489 participants (60-93 years) of whom 216 experienced childhood abuse. Functional disabilities were measured using the World Health Organization Disability Assessment Scale. Multivariable regression and mediation analyses were used to study the association between childhood abuse and functional disabilities and whether it was mediated by depression characteristics (severity and age at onset), number of chronic diseases or lifestyle factors (smoking, alcohol, body mass index). **Results:** Childhood abuse was significantly associated with functional disabilities. There was no moderating effect of depression. Depression severity, age at depression onset and the number of chronic diseases significantly mediated the association between childhood abuse and functional disabilities. None of the life style factors were significant mediators. **Conclusions:** So, in older adults, a history of childhood abuse was related to more functional disabilities in daily life, which was fully explained by having more depressive symptoms, younger age at depression onset and more chronic diseases. These findings emphasize the importance of awareness of childhood abuse in treatment and prevention strategies, as well as taking depression characteristics and physical health into account.

Key words: childhood abuse; functional disabilities; late-life depression; chronic somatic diseases; life style; mediation.

Introduction

Childhood abuse has been shown to have detrimental effects on psychological, social and physical aspects of life, notwithstanding age (Draper et al., 2008). Particularly later in life, many people are confronted with daily functional disabilities concerning "socially defined roles and tasks that are expected within a sociocultural and physical environment" (Wiersma, 1996). These disabilities may be present in several domains of daily functioning, including cognition, mobility, self-care, getting along, household activities or participation in society (Chwastiak & Von Korff, 2003). Hence, due to age-related deterioration of physical health and social functioning, childhood abuse might be even more clearly related to lower levels of functioning in older age. However, to date, research on the association between childhood abuse and disabilities in daily life has predominantly been performed in females and in younger adults (e.g. Walker et al., 1999; Chartier et al., 2007; Wegman and Stetler, 2009), but not yet in older adults.

Underlying mechanisms for the association between childhood abuse and functional disabilities might be that abused persons have more mental and physical health problems or engage in less healthy life styles (e.g. Sachs-Ericsson et al., 2009). Associations have been found between childhood abuse and mental health disorders (Kessler et al., 2010), such as depression in younger and older adults (Hovens et al., 2010; Comijs et al., 2013). Childhood abuse affects the age at first onset as well as the severity of the depression, in younger but also in older adults (Hovens et al., 2015; Wielaard et al., 2017). In addition, associations have been found between childhood abuse and various health parameters in adulthood, such as having physical symptoms or a chronic somatic disease (e.g. migraine headaches, back problems, metabolic syndrome, gastrointestinal symptoms) or an increased number of medical contacts for physical health problems (Leserman et al., 1996; Fergusson et al., 2013; Midei et al., 2013; Danese & Tan, 2014; Afifi et al., 2016). A meta-analysis of Wegman & Stetler (2009) also showed an increased risk of physical health problems in abused adults, with largest effect sizes for neurological and musculoskeletal problems. Furthermore, childhood abuse has been linked to less healthy life style factors. Several studies showed that childhood abuse is associated with smoking, alcoholism and a higher body mass index (BMI) (Walker et al., 1999; Anda et al., 2006; Rehkopf et al., 2016). Anda et al. (2006) also showed that the risk for such an unhealthy life style increased with the number of negative childhood experiences.

Particularly in older adults, decreasing physical health becomes apparent and influences functioning in daily life. Cross-sectionally, the risk for functional disabilities increased with the number of chronic diseases, particularly for females and adults older than 75 years (Jindai et al., 2016). The number of chronic diseases was associated with functional disabilities two years later (Barile et al., 2013); however, only Activities of Daily Living (ADL) such as bathing, dressing, eating were taken into account. Although chronic diseases might affect life style factors, life style factors also independently influence functional disabilities. Obesity increased the risk of

limited mobility in younger adults (Bell et al., 2017); smoking and having a high BMI were associated with a longer period of lower levels of ADL in later life (Jacob et al., 2016). Consequently, one might suggest that physical health and life style factors mediate the association between childhood abuse and functional disabilities. In addition, mental health disorders such as depression were linked to functional disabilities, also in older adults (Penninx et al., 1999; Ormel et al., 2002). In depressed older adults, chronic diseases partly explained an increased risk for lower levels of ADL (Penninx et al., 1999). In depressed younger adults, the severity of depressive symptoms was the strongest predictor for functional disabilities in daily life measured for several domains (Van Der Werff et al., 2010). Furthermore, Ormel et al., (2002) investigated the reciprocal effects between depressive symptoms and functional disabilities concerning ADL and instrumental ADL (iADL) such as cooking, shopping and housekeeping, and concluded this might be an indirect association through physical health. Depression could either be a moderating or mediating factor.

To summarize, studies have shown associations between childhood abuse, mental and physical health disorders, lifestyle factors and functional disabilities separately. Yet, few studies have investigated these in concert. Therefore we aimed to investigate the association between childhood abuse and functional disabilities in daily life (e.g. cognition, mobility, self-care, getting along, life activities and participation in society) in older adults; and to study the role of depression characteristics, chronic somatic diseases and life style factors in this association. Our hypothesis would be that in older adults childhood abuse is associated with functional disabilities in daily life and that depression characteristics, chronic somatic diseases and life style factors mediate this association. In addition, we examine whether this association is moderated by the presence of depression.

Methods

Study sample

Baseline cross-sectional data were used from the Netherlands Study of Depression in Older Persons (NESDO; https://nesdo.onderzoek.io/). More detailed information can be found in the design paper (Comijs et al., 2011). In short, at baseline, 378 participants with a current 6-month late-life depression and 132 non-depressed controls from five regions in the Netherlands were interviewed. Depressed participants were included if they met the DSM-IV-TR criteria (APA, 2000) for major depressive disorder (MDD), dysthymia or minor depression, as assessed by the Composite International Diagnostic Interview (CIDI). Exclusion criteria were a (possible) diagnosis of dementia or another severe psychiatric disorder based on clinical judgment, a score under 18 out of 30 on the Mini Mental State Examination (MMSE) (Folstein et al., 1975) and insufficient command of the Dutch language. The non-depressed comparison group had no lifetime diagnosis of depression. For the present study, we selected participants that provided

information on childhood abuse, depression as well as functional disabilities in daily life at baseline. From the baseline group, three subjects had missing data on childhood abuse and 18 subjects had insufficient data from the questionnaire on functional disabilities. These participants were excluded. This resulted in a total of 489 participants in this study. The study design was approved by the Ethical Review Board of the VU University Medical Center and all participating centers and written informed consent was obtained from all participants.

Measurements

Functional disabilities

Functional disabilities in daily life were assessed using the World Health Organization Disability Assessment Scale (WHO DAS) (Chwastiak & Von Korff, 2003). This is a 39-item questionnaire, in which participants recorded their functional disabilities over six different domains, namely cognition (understanding and communicating), mobility (getting around), self-care, getting along, life (household) activities and participation in society. Scores were standardized and range from 0-100 for each of the six domains as well as for the total score. Higher scores indicate more functional disabilities.

Childhood abuse

The Childhood Abuse Inventory, previously used in the Netherlands Mental Health Survey and Incidence Study (NEMESIS) (De Graaf et al., 2004), is a structured interview that assesses the presence and frequency of childhood abuse. This measurement retrospectively inquires about people's childhood (before the age of 16), recording the occurrence and frequency of several types of childhood abuse. Four types of childhood abuse were considered, namely emotional neglect (lack of parental attention/support and ignorance of one's problems), psychological abuse (verbal abuse, punishment without reason, being blackmailed), physical abuse (being kicked or hit) and sexual abuse (sexually touched against one's will, or forced to touch someone sexually). In our analyses, we used dichotomized (yes/no) variables for every type of abuse, where "no" is considered "no abuse at all". In addition, a childhood abuse index (CAI) was calculated as the sum of the recorded frequencies of these events (never=0; once, sometimes=1; regularly, often or very often=2), ranging from 0-8. Higher scores indicate a higher frequency of childhood abuse (Wiersma et al., 2009).

Moderating & mediating variables

Several variables were considered as mediating variables, including depression characteristics (severity, age at onset), number of chronic somatic diseases and lifestyle factors (smoking, alcohol use and BMI). Depression characteristics included the severity of depressive symptoms and age at depression onset. For the regression analysis, we considered a formal depression diagnosis (dichotomous yes-no variable). A formal diagnosis of depression, according to the DSM-IV-TR criteria (APA, 2000), was determined using the Composite International Diagnostic Interview (CIDI; WHO-version 2.1; lifetime version). This structured clinical interview has high

validity for depressive disorders and is particularly used in research settings (Wittchen et al., 1991). For this study, we included a 6-month MDD or dysthymia diagnosis or minor depression diagnosis. The severity of depression was assessed with the Inventory of Depressive Symptomatology – Self-report version (IDS-SR) (Rush et al., 1996), and the age at onset of depression was obtained from the CIDI. The number of chronic somatic diseases was assessed with a self-report questionnaire asking for the presence of most frequent occurring chronic diseases in older adults, namely COPD (i.e. asthma, chronic bronchitis), cardiac disease, peripheral atherosclerosis, stroke, diabetes mellitus, arthritis, rheumatic diseases, cancer, ulcers, intestinal problems, liver disease(s), epilepsy, allergies, thyroid disease, injuries due to accident(s) or any other disease. Kriegsman et al. (1996) showed that self-reports of these diseases was fairly adequate and independent of cognitive impairment; only peripheral atherosclerosis and arthritis were less accurate reported. In addition, we considered several lifestyle factors as mediating variables, such as smoking, alcohol use and Body Mass Index (BMI). Smoking was assessed with standard questions on past and current smoking behavior. The Alcohol Use Disorders Identification Test (AUDIT) was used to assess the use of alcohol (Babor et al., 1989). BMI was calculated as weight (kg) divided by height-squared (m^2).

Covariates

Several variables were considered as covariates. Socio-demographic variables such as age, gender, education level and socio-economic status (income) were included, as well as the use of benzodiazepines (ATC-codes: N03AE, N05BA, N05CD, N05CF) and anti-depressive medication (ATC-codes: N06AA, N06AB, N06AF, N06AG, N06AX)). These were obtained with standard questions. In addition, comorbid anxiety disorder and the number of negative life events were considered as covariates. Having a current anxiety disorder (last 6-month diagnosis), such as social phobia, panic disorder, agoraphobia, and general anxiety disorder, was assessed by the CIDI. The number of negative life events was determined by the Brugha questionnaire (Brugha et al., 1985).

Statistical analyses

Differences in characteristics between participants with and without childhood abuse were analyzed using independent samples t-tests, Mann-Whitney U-tests or Chi-squared tests. When differences ($p \leq .05$) between these groups were found or when the strength of the association between childhood abuse and functional disabilities changed ≥10% when the variable of interest was added to the regression model, they were used as covariates in subsequent analyses. Multicollinearity was investigated using a correlation matrix, where a correlation coefficient ≥0.50 was considered as an indication of multicollinearity.

Univariate and multivariate linear regression analyses for the association between childhood abuse and the domains of functional disabilities in daily life (measured by the WHO DAS) were performed. Childhood abuse was the predictor variable, and functional disabilities the outcome

variable. To study whether the association is moderated by depression, an interaction term childhood abuse*depression (having a depression diagnosis (yes/no)) was included in the adjusted model. In addition multivariate mediation analyses on the association between childhood abuse and the functional disability domains, with depression, somatic diseases and lifestyle factors as mediators (Figure 1) were performed. Following Preacher & Hayes (2008), we used a multiple mediation model quantifying the indirect effect of the independent variable (childhood abuse) on the dependent variable (functional disabilities) through one or more mediator(s) by testing the effect of childhood abuse on the mediator (a) and by testing the effect of the mediator on functional disabilities (b). The product "a x b" quantifies the indirect effect through the mediators, and was obtained using a bootstrapping procedure with 5000 bootstrap samples. The direct effect of childhood abuse on functional disabilities with consideration of the mediation effect was quantified as "c' ". When the bias corrected 95%-confidence interval did not contain zero, we considered the mediating effect significant. First, we investigated the mediating effect of all mediating variables adjusted for relevant confounders separately. Secondly, we created a mediation model with all variables in one complete model. In addition, we calculated the change in effect using the following formula: $\Delta B = ((c-c') / c) \times 100$. This process was repeated for the associations between the CAI and functional disabilities. Exploratory analyses were executed to investigate the association between childhood abuse and each of the domains of functional disabilities. All domains were normally distributed, except for the 'self-care' domain which had a slightly positive skewness. Since transformation techniques did not improve normality, we accepted the slightly positive skewness, since it was within acceptable margins.

All p-values were tested two-tailed and p-values ≤.05 were considered as statistically significant. Statistical Package of the Social Sciences version 22.0 (SPSS 2013) was used to conduct all statistical analyses.

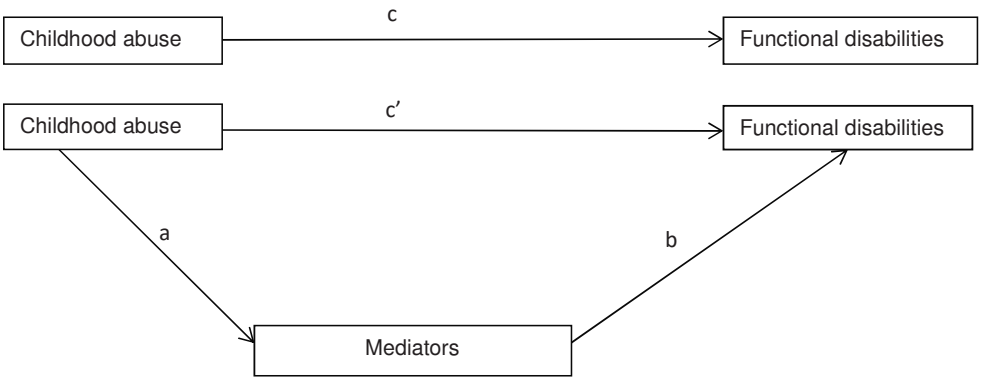

Figure 1. Direct effect of childhood abuse on daily functional disabilities (c); and multivariable mediation analysis (Preacher & Hayes, 2008) of childhood abuse on daily functional disabilities (c').

Results

Sample Characteristics

Baseline characteristics of persons with and without a history of childhood abuse are shown in Table 1. In total 489 participants were selected of which 216 (44.2%) older adults reported a history of childhood abuse. Participants that experienced childhood abuse were significantly younger at baseline; they more often had a comorbid anxiety disorder and used relatively more often anti-depressive medication. Furthermore, participants with a history of childhood abuse scored significantly higher on all domains of functional disabilities, more often had a depression diagnosis, experienced more severe depressive symptoms and had a younger age at depression onset. They had also more chronic diseases, but did not significantly differ with respect to any of the lifestyle factors. In subsequent analyses only comorbid anxiety disorder was considered as covariate, based on a ≥10% change of the regression coefficient of the dependent variable. Collinearity was considered as correlations above 0.50. None of the correlations coefficients of the predictor variables exceeded 0.50.

First, we performed a linear regression analysis for the association between childhood abuse and functional disabilities in daily life (total score on the WHO DAS) and investigated whether this association was moderated by depression diagnosis. The association between childhood abuse and functional disabilities was significant (B (95% CI)= 7.81 (5.41-10.22), p<0.001), also when adjusted for the covariate (B (95% CI)= 5.97 (3.69-8.25, p<0.001). Next, we added an interaction term to this model to investigate whether there was an interaction effect between childhood abuse and depression diagnosis. We found no significant interaction effect for childhood abuse*depression diagnosis with functional disabilities (B (95% CI)= 3.23 (-2.33-8.80), p=0.25).

Table 1. Baseline characteristics of persons with a history of childhood abuse (N=216) and persons without a history of childhood abuse (N=273).

Characteristics	N N=489	Childhood abuse N=216	No childhood abuse N=273	Test value[1] (df)	p
Socio-demographics					
Female, N (%)	489	143 (66.2)	172 (63.0)	X^2= 0.54 (1)	.46
Age, mean (SD)	489	69.19 (7.01)	71.31 (7.27)	t= 3.26 (487)	.001
Years of education, mean (SD)	489	10.89 (3.65)	11.14 (3.52)	t= 0.76 (487)	.45
Functional limitations (standardized scores 0-100)					
1. Understanding and Communicating, mean (SD)	489	28.52 (19.07)	18.98 (18.04)	t= -5.66 (487)	<.001
2. Getting around, mean (SD)	489	24.28 (21.68)	18.22 (21.51)	t= -3.08 (487)	.002
3. Self care, median (IQR)	489	6.00 (19)	0.00 (13)	U= 23967.50	<.001

4. Getting along with people, mean (SD)	489	24.81 (14.62)	17.05 (14.55)	t= -5.85 (487)	<.001
5. Household activities, mean (SD)	489	28.50 (20.84)	19.35 (19.71	t= -4.97 (487)	<.001
6. Participation in society, mean (SD)	489	27.85 (15.94)	18.23 (16.81)	t= -6.43 (487)	<.001
Total score 32 items (excl. work items), mean (SD)	489	25.01 (13.08)	17.20 (13.71)	t= -6.39 (487)	<.001
Childhood abuse					
Emotional neglect, N (%)	434	161 (37.1)	-	-	-
Psychological neglect, N (%)	375	102 (27.2)	-	-	-
Physical abuse, N (%)	332	59 (17.8)	-	-	-
Sexual abuse, N (%)	365	92 (25.2)	-	-	-
Childhood abuse index, median (IQR)	489	3 (2)	-	-	-
Mediating variables					
Depression diagnosis, N (%)	489	195 (90.3)	166 (60.8)	X^2= 54.20 (1)	<.001
Total scores on IDS, mean (SD)	488	29.72 (14.47)	19.89 (14.36)	t= -7.49 (486)	<.001
Age at onset of depression, mean (SD)	353	43.71 (20.93)	53.75 (18.41)	t= 4.80 (350.54)	<.001
Number of chronic diseases, mean (SD)	489	2.17 (1.52)	1.79 (1.34)	t= -2.97 (487)	.003
Cigarettes per day, median (IQR)	337	1.73 (8)	3.74 (8)	U=12685.00	.10
AUDIT total score, median (IQR)	487	2.00 (4)	2.00 (4)	U= 28976.50	.85
Body Mass Index, median (IQR)	488	25.89 (5.54)	26.04 (4.52)	U= 28595.00	.63
Total MET minutes/week, median (IQR)	406	1695.00 (2915)	2079.00 (3519)	U= 19104.00	.28
Covariates					
Comorbid anxiety disorder, N (%)	489	83 (38.4)	59 (21.6)	X^2= 16.55 (1)	<.001
Number of negative life events (past 5 yrs), mean (SD)	489	1.76 (1.40)	1.55 (1.25)	t= -1.78 (487)	0.08
MMSE, median (IQR)	489	28.00 (2)	28.00 (2)	U=27716.50	.25
Medication					
Frequent use of benzo, N (%)	489	67 (31.0)	77 (28.2)	X^2= 0.46 (1)	.50
Frequent use of AD, N (%)	489	126 (58.3)	137 (50.2)	X^2= 3.22 (1)	.07

[1]Continuous variables are analyzed using independent samples t-tests, categorical variables are analyzed using Chi-squared statics and non-normally distributed variables are analyzed using independent samples Mann-Whitney U-test.

Abbreviation: IDS = Inventory of Depressive Symptomatology; AUDIT = Alcohol Use Disorders Identification Test; MET = Metabolic Equivalent Total; AD= anti-depressive medication; IQR = interquartile range.

Next, multivariable mediation analyses were performed investigating whether the association between childhood abuse and functional disabilities in daily life (total score on the WHO DAS) was mediated by depression characteristics, the number of chronic diseases and several lifestyle

factors. Table 2 shows the results of the mediation analysis with childhood abuse (dichotomous "yes/no") as predictor variable, while Table 3 shows the results with total scores on the childhood abuse index (CAI) as predictor variable. The direct association between childhood abuse ("yes/no") and functional disabilities (c) was significant. Including every mediating variable separately showed that depression severity, the age at onset of depression and the number of chronic diseases significantly mediated the association (a x b). None of the lifestyle factors (smoking, alcohol use or BMI) mediated the association between childhood abuse and functional disabilities. Looking at the separate mediating variables, depression severity led to the largest change in direct effect (ΔB= -91.9%), followed by the age at depression onset (ΔB= -34.43%) and the number of chronic diseases (ΔB= -17.42%). Including all significant variables in one model showed that only depression severity stayed a significant mediator. The direct effect corrected for a x b (c') of childhood abuse on functional disabilities was no longer significant in a complete model, the mediation effect significantly reduced the direct effect. Comparable results were found for mediation analysis with the CAI as predictor variable (see Table 3). In the model where all significant mediating variables were included, depression severity as well as the number of chronic diseases stayed significant mediating variables for the association between the CAI and functional disabilities.

To investigate whether the association was present for all six domains of the WHO DAS, these mediation analyses were repeated for every separate domain including the significantly mediating variables in the previous model (depression severity, age at depression onset and number of chronic diseases). First, the direct effect (c) between childhood abuse and functional disabilities was significant concerning the separate domains of 'cognition', 'mobility', 'getting along', 'life (household) activities' and 'participation in society'. The direct effect (c) between childhood abuse and the domain of 'self-care' was not significant. For the domains 'cognition, 'getting along' and 'participation in society' all three mediating variables were significant mediators in separate analyses (a x b). Including them in one model, we found that only depression severity stayed a significant mediator for the domains of 'cognition' and 'participation in society'. Considering 'getting along', depression severity and age at depression onset stayed significant mediators in the complete model. For the domains 'mobility' and 'life (household) activities', depression severity and number of chronic diseases significantly mediated this association (a x b); both stayed significant mediators when they were included in the same model. For all separate domains that had a significant direct effect (c), the direct effect corrected for the mediation effect (c') was no longer significant in a complete model (led to a reduction of the direct effect from 72-81%). Finally, results for the CAI were comparable for every separate domain (data not shown).

Table 2. Multivariable mediation analysis on the association between childhood abuse and functional disabilities through depression severity, age at depression onset, number of chronic diseases and several lifestyle factors.

		a		b		c		c'		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.70 (0.03)	<0.001	5.96 (1.16)	<0.001	0.48 (0.81)	0.55	5.49 (3.78 – 7.28)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.10 (0.03)	0.003	2.73 (1.27)	0.03	1.79 (1.29)	0.17	0.93 (0.31 – 1.88)*
Chronic diseases	489	0.36 (0.13)	0.01	2.88 (0.38)	<0.001	5.97 (1.16)	<0.001	4.93 (1.11)	<0.001	1.04 (0.27 – 1.93)*
Smoking (log)	337	0.08 (0.11)	0.46	0.99 (0.67)	0.14	5.33 (1.38)	<0.001	5.24 (1.38)	<0.001	0.09 (-0.10 – 0.55)
AUDIT (log)	487	0.02 (0.08)	0.82	-4.62 (0.66)	<0.001	5.91 (1.16)	<0.001	5.99 (1.11)	<0.001	-0.08 (-0.79 – 0.66)
BMI (log)	488	0.01 (0.02)	0.47	5.59 (3.59)	0.12	5.91 (1.16)	<0.001	5.85 (1.16)	<0.001	0.06 (-0.07 – 0.46)
Complete model[1]	352					2.73 (1.27)	0.03	-0.31 (1.00)	0.76	3.07 (1.34 – 4.89)*
Individual effect										
Depression severity		4.35 (1.34)	0.001	0.57 (0.04)	<0.001					2.50 (1.02 – 4.17)*
Age at depression onset		-9.95 (2.13)	<0.001	-0.03 (0.03)	0.26					0.28 (-0.21 – 0.89)
Chronic diseases		0.28 (0.16)	0.08	1.00 (0.34)	0.003					0.29 (-0.002 – 0.80)

[1]Mediation model based on significant separate mediators: complete model mediated by depression severity, age at depression onset and chronic diseases.

*significant based on 95% confidence interval (CI), bootstrap p<.0.05.

NB. Bootstrapping: 5000 bootstrap samples; BC 95% CI= bias corrected 95% confidence interval.

Note. All analyses were adjusted for having a comorbid anxiety disorder. Mediation analyses were based on Preacher & Hayes, 2008.

Table 3. Multivariable mediation analysis on the association between the childhood abuse index and functional disabilities through depression severity, age at depression onset, number of chronic diseases and several lifestyle factors.

		a		b		c		c′		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.70 (0.03)	<0.001	1.49 (0.28)	<0.001	0.02 (0.20)	0.90	1.46 (1.06 – 1.89)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.09 (0.03)	0.005	0.79 (0.29)	0.006	0.58 (0.29)	0.05	0.21 (0.06 – 0.41)*
Chronic diseases	489	0.12 (0.03)	<0.001	2.82 (0.38)	<0.001	1.49 (0.28)	<0.001	1.15 (0.27)	<0.001	0.34 (0.13 – 0.61)*
Smoking (log)	337	0.02 (0.03)	0.59	1.01 (0.67)	0.13	1.36 (0.33)	<0.001	1.34 (0.33)	<0.001	0.02 (-0.03 – 0.12)
AUDIT (log)	487	0.03 (0.02)	0.13	-4.86 (0.66)	<0.001	1.48 (0.28)	<0.001	1.62 (0.27)	<0.001	-0.14 (-0.35 – 0.05)
BMI (log)	488	-0.0002 (0.004	0.96	6.23 (3.58)	0.08	1.46 (0.28)	<0.001	1.46 (0.28)	<0.001	<0.001 (-0.06 – 0.05)
Complete model[1]	352					0.79 (0.29)	0.006	-0.11 (0.23)	0.65	0.90 (0.51 – 1.31)*
Individual effect										
Depression severity		1.28 (0.30)	<0.001	0.57 (0.04)	<0.001					0.74 (0.41 – 1.12)*
Age at depression onset		-2.29 (0.48)	<0.001	-0.03 (0.03)	0.24					0.07 (-0.04 – 0.20)
Chronic diseases		0.09 (0.04)	<0.01	1.01 (0.34)	0.003					0.09 (0.02 – 0.25)*

[1]Mediation model based on significant separate mediators: complete model mediated by depression severity, age at depression onset and chronic diseases.

*significant based on 95% confidence interval (CI), bootstrap p<.0.05.

NB. Bootstrapping: 5000 bootstrap samples; BC 95% CI= bias corrected 95% confidence interval.

Note. All analyses were adjusted for having a comorbid anxiety disorder. Mediation analyses were based on Preacher & Hayes, 2008.

Table 4. Multivariable mediation analysis on the association between childhood abuse and six domains of functional disabilities through depression severity, age at depression onset and number of chronic diseases.

		a		b		c		c'		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
1. UNDERSTANDING & COMMUNICATING										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.82 (0.05)	<0.001	7.41 (1.64)	<0.001	0.94 (1.33)	0.48	6.47 (4.50 – 8.80)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.11 (0.05)	0.02	3.64 (1.91)	0.06	2.54 (1.95)	0.19	1.12 (0.19 – 2.43)*
Chronic diseases	489	0.36 (0.13)	<0.01	2.02 (0.56)	<0.001	7.37 (1.63)	<0.001	6.65 (1.62)	<0.001	0.72 (0.21 – 1.64)*
Complete model[1]	352					3.70 (1.91)	0.05	0.21 (1.69)	0.90	3.51 (1.39 – 5.76)*
Individual effect										
Depression severity		4.35 (1.34)	0.001	0.76 (0.07)	<0.001					3.31 (1.34 – 5.42)*
Age at depression onset		-9.95 (2.13)	<0.001	-0.03 (0.04)	0.47					0.32 (-0.55 – 1.33)
Chronic diseases		0.28 (0.16)	0.08	-0.44 (0.57)	0.44					-0.12 (-0.80 – 0.15)
2. GETTING AROUND										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.75 (0.06)	<0.001	4.00 (1.94)	0.04	-1.91 (1.76)	0.28	5.93 (3.83 – 8.12)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.08 (0.06)	0.18	1.14 (2.34)	0.63	0.36 (2.40)	0.88	0.77 (-0.35 – 2.23)
Chronic diseases	489	0.36 (0.13)	<0.01	5.49 (0.62)	<0.001	3.93 (1.93)	0.04	1.96 (1.81)	0.28	1.99 (0.54 – 3.66)*
Complete model[1]	488					4.00 (1.94)	0.04	-2.27 (1.70)	0.18	6.30 (4.01 – 8.73)*
Individual effect										
Depression severity		7.88 (1.25)	<0.001	0.63 (0.06)	<0.001					4.98 (3.15 – 7.10)*
Chronic diseases		0.37 (0.13)	0.006	3.58 (0.59)	<0.001					1.32 (0.35 – 2.57)*
3. SELF CARE										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.48 (0.04)	<0.001	2.13 (1.26)	0.09	-1.63 (1.16)	0.16	3.78 (2.46 – 5.27)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.04 (0.04)	0.34	-0.38 (1.57)	0.81	-0.75 (1.62)	0.64	0.38 (-0.36 – 1.30)
Chronic diseases	489	0.36 (0.13)	0.01	2.07 (0.43)	<0.001	2.11 (1.26)	0.10	1.37 (1.24)	0.27	0.75 (0.19 – 1.57)*
Complete model[1]	488					2.13 (1.26)	0.09	-1.70 (1.16)	0.14	3.83 (2.55 – 5.38)*
Individual effect										
Depression severity		7.88 (1.25)	<0.001	0.45 (0.04)	<0.001					3.57 (2.36 – 5.16)*
Chronic diseases		0.37 (0.13)	0.01	0.70 (0.40)	0.09					0.26 (-0.02 – 0.84)

		a		b		c		c′		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
4. GETTING ALONG WITH PEOPLE										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.53 (0.04)	<0.001	6.30 (1.31)	<0.001	2.10 (1.17)	0.07	4.22 (2.84 – 5.78)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.12 (0.04)	0.002	3.36 (1.50)	0.03	2.50 (1.53)	0.15	1.17 (0.42 – 2.39)*
Chronic diseases	489	0.36 (0.13)	0.01	1.35 (0.45)	0.003	6.35 (1.31)	<0.001	5.87 (1.31)	<0.001	0.48 (0.11 – 1.11)*
Complete model[1]	352					3.33 (1.50)	0.03	0.87 (1.45)	0.55	2.47 (1.18 – 4.01)*
Individual effect										
Depression severity		4.35 (1.34)	0.001	0.41 (0.06)	<0.001					1.76 (0.73 – 3.09)*
Age at depression onset		-9.95 (2.13)	<0.001	-0.08 (0.04)	0.04					0.75 (0.07 – 1.84)*
Chronic diseases		0.28 (0.16)	0.08	-0.16 (0.48)	0.75					-0.04 (-0.48 – 0.19)
5. HOUSEHOLD ACTIVITIES										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.73 (0.06)	<0.001	7.34 (1.83)	<0.001	1.59 (1.65)	0.34	5.75 (3.93 – 8.10)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.08 (0.05)	0.13	5.13 (2.13)	0.02	4.31 (2.19)	0.05	0.82 (-0.22 – 2.20)
Chronic diseases	489	0.36 (0.13)	0.01	3.93 (0.60)	<0.001	7.41 (1.83)	<0.001	6.00 (1.77)	<0.001	1.41 (0.38 – 2.67)*
Complete model[1]	488					7.34 (1.83)	<0.001	1.39 (1.63)	0.40	5.96 (3.90 – 8.22)*
Individual effect										
Depression severity		7.88 (1.25)	<0.001	0.67 (0.06)	<0.001					5.25 (3.36 – 7.31)*
Chronic diseases		0.37 (0.13)	0.01	1.95 (0.57)	<0.001					0.70 (0.20 – 1.65)*
6. PARTICIPATION IN SOCIETY										
Separate mediators										*Total model*
Depression severity	488	7.88 (1.25)	<0.001	0.76 (0.04)	<0.001	7.35 (1.43)	<0.001	1.36 (1.11)	0.22	6.01 (4.07 – 8.04)*
Age at depression onset	353	-9.89 (2.12)	<0.001	-0.11 (0.04)	<0.01	3.16 (1.59)	0.05	2.08 (1.62)	0.20	1.08 (0.36 – 2.12)*
Chronic diseases	489	0.36 (0.13)	0.01	2.82 (0.45)	<0.001	7.44 (1.43)	<0.001	6.42 (1.39)	<0.001	1.03 (0.28 – 2.04)*
Complete model[1]	352					3.10 (1.59)	0.05	-0.10 (1.40)	0.94	3.21 (1.36 – 5.31)*
Individual effect										
Depression severity		4.35 (1.34)	0.001	0.60 (0.06)	<0.001					2.62 (1.01 – 4.43)*
Age at depression onset		-9.95 (2.13)	<0.001	-0.04 (0.04)	0.23					0.42 (-0.17 – 1.18)
Chronic diseases		0.28 (0.16)	0.08	0.60 (0.47)	0.20					0.17 (-0.04 – 0.79)

[1]Mediation model based on significant separate mediators: complete model mediated by depression severity, age at depression onset and chronic diseases.
*significant based on 95% confidence interval (CI), bootstrap p<.0.05. NB: Bootstrapping: 5000 bootstrap samples; BC 95% CI= bias corrected 95% confidence interval.
Note. All analyses were adjusted for having a comorbid anxiety disorder. Mediation analyses were based on Preacher & Hayes, 2008.

Table 5. Multivariable mediation analysis on the association between the childhood abuse index and six domains of functional disabilities through depression severity, age at depression onset and number of chronic diseases.

		a		b		c		c′		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
1. UNDERSTANDING & COMMUNICATING										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.83 (0.05)	<0.001	1.81 (0.40)	<0.001	0.08 (0.33)	0.80	1.74 (1.23 – 2.26)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.11 (0.05)	0.03	1.00 (0.43)	0.02	0.75 (0.44)	0.09	0.25 (0.04 – 0.56)*
Chronic diseases	489	0.12 (0.03)	<0.001	1.93 (0.56)	<0.001	1.80 (0.40)	<0.001	1.57 (0.40)	<0.001	0.23 (0.07 – 0.48)*
Complete model[1]	352					1.01 (0.43)	0.02	0.004 (0.39	0.99	1.01 (0.51 – 1.55)*
Individual effect										
Depression severity		1.28 (0.30)	<0.001	0.76 (0.07)	<0.001					0.98 (0.54 – 1.53)*
Age at depression onset		-2.29 (0.48)	<0.001	-0.03 (0.04)	0.45					0.07 (-0.13 – 0.30)
Chronic diseases		0.09 (0.04)	0.01	-0.44 (0.57)	0.44					-0.04 (-0.21 – 0.06)
2. GETTING AROUND										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.75 (0.06)	<0.001	1.17 (0.47)	0.01	-0.39 (0.43)	0.37	1.57 (1.11 – 2.14)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.07 (0.06)	0.23	0.51 (0.53)	0.34	0.34 (0.54)	0.53	0.16 (-0.09 – 0.49)
Chronic diseases	489	0.12 (0.03)	<0.001	5.46 (0.62)	<0.001	1.15 (0.47)	0.02	0.50 (0.44)	0.26	0.65 (0.25 – 1.13)*
Complete model[1]	488					1.17 (0.47)	0.01	-0.59 (0.42)	0.16	1.77 (1.22 - 2.37)*
Individual effect										
Depression severity		2.09 (0.30)	<0.001	0.63 (0.06)	<0.001					1.33 (0.90 – 1.83)*
Chronic diseases		0.12 (0.03)	<0.001	3.62 (0.60)	<0.001					0.44 (0.17 – 0.82)*
3. SELF CARE										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.48 (0.04)	<0.001	0.68 (0.31)	0.03	-0.32 (0.29)	0.27	0.99 (0.70 – 1.35)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.03 (0.04)	0.48	0.26 (0.35)	0.47	0.20 (0.37)	0.59	0.06 (-0.12 – 0.27)
Chronic diseases	489	0.12 (0.03)	<0.001	2.02 (0.43)	<0.001	0.67 (0.31)	0.03	0.43 (0.31)	0.16	0.24 (0.09 – 0.48)*
Complete model[1]	488					0.68 (0.31)	0.03	-0.36 (0.29)	0.21	1.03 (0.73 – 1.40)*
Individual effect										
Depression severity		2.09 (0.30)	<0.001	0.45 (0.04)	<0.001					0.94 (0.66 – 1.32)*
Chronic diseases		0.12 (0.03)	<0.001	0.72 (0.41)	0.08					0.09 (-0.01 – 0.26)

		a		b		c		c′		a x b (bootstrapping)
	n	B (SE)	p	B (SE)	p	B (SE)	p	B(SE)	p	B (BC 95% CI)
4. GETTING ALONG WITH PEOPLE										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.54 (0.04)	<0.001	1.38 (0.32)	<0.001	0.25 (0.29)	0.40	1.14 (0.81 – 1.52)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.12 (0.04)	0.002	0.76 (0.34)	0.03	0.49 (0.35)	0.16	0.27 (0.10 – 0.53)*
Chronic diseases	489	0.12 (0.03)	<0.001	1.30 (0.45)	0.004	1.40 (0.32)	<0.001	1.24 (0.32)	<0.001	0.15 (0.04 – 0.35)*
Complete model[1]	352					0.75 (0.34)	0.03	0.06 (0.33)	0.85	0.68 (0.39 – 1.08)*
Individual effect										
Depression severity		1.28 (0.30)	<0.001	0.41 (0.06)	<0.001					0.52 (0.28 – 0.85)*
Age at depression onset		-2.29 (0.48)	<0.001	-0.08 (0.04)	0.03					0.18 (0.03 – 0.39)*
Chronic diseases		0.09 (0.04)	0.01	-0.15 (0.49)	0.76					-0.01 (-0.13 – 0.07)
5. HOUSEHOLD ACTIVITIES										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.74 (0.06)	<0.001	1.59 (0.45)	<0.001	0.04 (0.41)	0.92	1.55 (1.12 – 2.10)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.09 (0.05)	0.11	0.99 (0.48)	0.04	0.80 (0.50)	0.11	0.20 (-0.03 – 0.51)
Chronic diseases	489	0.12 (0.03)	<0.001	3.91 (0.61)	<0.001	1.61 (0.45)	<0.001	1.15 (0.44)	0.01	0.46 (0.20 – 0.85)*
Complete model[1]	488					1.59 (0.45)	<0.001	-0.07 (0.40)	0.87	1.66 (1.18 – 2.25)*
Individual effect										
Depression severity		2.09 (0.30)	<0.001	0.68 (0.06)	<0.001					1.42 (1.00 – 1.96)*
Chronic diseases		0.12 (0.03)	<0.001	1.97 (0.57)	<0.001					0.24 (0.08 – 0.50)*
6. PARTICIPATION IN SOCIETY										
Separate mediators										*Total model*
Depression severity	488	2.09 (0.30)	<0.001	0.76 (0.04)	<0.001	1.91 (0.35)	<0.001	0.32 (0.27)	0.24	1.59 (1.15 – 2.06)*
Age at depression onset	353	-2.27 (0.48)	<0.001	-0.10 (0.04)	0.01	1.03 (0.36)	0.004	0.81 (0.37)	0.03	0.23 (0.06 – 0.46)*
Chronic diseases	489	0.12 (0.03)	<0.001	2.71 (0.48)	<0.001	1.93 (0.35)	<0.001	1.61 (0.34)	<0.001	0.32 (0.12 – 0.61)*
Complete model[1]	352					1.02 (0.36)	0.01	0.11 (0.32)	0.74	0.92 (0.48 – 1.35)*
Individual effect										
Depression severity		1.28 (0.30)	<0.001	0.60 (0.06)	<0.001					0.77 (0.39 – 1.17)*
Age at depression onset		-2.29 (0.48)	<0.001	-0.04 (0.03)	0.26					0.09 (-0.04 – 0.27)
Chronic diseases		0.09 (0.04)	0.01	0.58 (0.47)	0.22					0.06 (-0.02 – 0.24)

[1]Mediation model based on significant separate mediators: complete model mediated by depression severity, age at depression onset and chronic diseases.
*significant based on 95% confidence interval (CI), bootstrap p<.0.05. NB. Bootstrapping: 5000 bootstrap samples; BC 95% CI= bias corrected 95% confidence interval.
Note. All analyses were adjusted for having a comorbid anxiety disorder. Mediation analyses were based on Preacher & Hayes, 2008.

Discussion

The aim of the present study was to examine whether childhood abuse was associated with functional disabilities in older adults, and which factors mediated this relation. Our results showed that older adults, who reported childhood abuse, had more functional disabilities in daily life compared to those without a history of abuse. This association was the same for persons with and without a depression. In accordance with our hypothesis, the association between childhood abuse and functional disabilities was mediated by depressive symptoms, age at depression onset and chronic diseases. In other words, older adults with a history of childhood abuse have more functional disabilities in daily life, which is explained by the presence of (more) depressive symptoms, a younger age at depression onset and chronic somatic diseases. None of the life style factors were significant, mediating variables. The results were comparable for the dichotomous and the continuous childhood abuse variable.

Our results are in line with studies in younger adults. In a sample of females aged 18-65 years, Walker et al. (1999) found that childhood abuse or neglect was associated with higher levels of functional disabilities. In addition, Cuijpers et al. (2011) found that childhood adversities, including childhood abuse, were associated with the highest number of years lost to disability, meaning that childhood abuse has a large impact on functional disabilities. In older psychiatric patients, ≥ 50 years of age, with a primary mood disorder, a strong association was found between childhood sexual abuse and functional disabilities, specifically ADL impairment (Talbot et al., 2009). Hence, childhood abuse seems to have a long-term negative impact on daily life; however, no previous studies have investigated which factors explain this association.

In our study, the severity of depressive symptoms played the most important role in the association between childhood abuse and functional disabilities. Previously, it has been shown that childhood abuse is associated with more severe depression and an earlier age at depression onset in younger and older adults (Bernet & Stein, 1999; Comijs et al., 2013; Nelson et al., 2017). Furthermore, studies showed that depression is associated with functional disabilities (Ormel et al., 2002; Braam et al., 2005; Verhaak et al., 2014). In younger adults, depression severity was also the most important characteristic that explained disability in depression (Van der Werff et al., 2010). Other studies also found that functional disabilities preceded depressive symptoms (Chen et al., 2012; Ormel et al., 2002; Verhaak et al., 2014), suggesting the association between depression and functional disability within our model could be reciprocal. Interestingly, we found that the age at depression onset most strongly mediated the association between childhood abuse and the domain of 'getting along', which might suggest that childhood abuse and a younger age at depression onset negatively affects social skills. This is in line with Van der Werff et al. (2010) who found that a younger age at depression onset was associated with more disability on the domain of 'getting along'. This might also suggest these skills could be an important target for treatment and prevention strategies.

Chronic diseases also significantly mediated the association between childhood abuse and functional disabilities. Previously, childhood abuse has been associated with chronic somatic diseases in both, younger and older adults (Wegman & Stetler, 2009; Afifi et al., 2016). An earlier study in NESDO by Comijs et al. (2013) already found that in case of late-onset depression, childhood abuse was associated with having more chronic diseases. In addition, using the same dataset, another study showed that somatic diseases were related to functional disability (Verhaak et al., 2014). We noticed that the number of chronic diseases is an important mediator especially for domains such as 'mobility' and 'life (household) activities'.

Surprisingly, none of the life style factors was mediating the association between childhood abuse and functional disabilities in older adults. One possible explanation is that there may be only a small effect of life style factors when people get older; however, a recent study by Patten et al. (2016) did not find adverse outcomes with respect to alcohol use and obesity in (very) young adults (14-27 years) in victims of childhood abuse. This might suggest that the impact of lifestyle changes with age and has the largest impact in middle-aged adults. A systematic review and meta-analysis by Norman et al. (2012) concluded that there was suggestive but inconclusive evidence of the effect of childhood abuse on life style factors, which might be due to the type of abuse and its definition or to differences in measurements.

In our study, consistent results were found for a dichotomous 'yes/no' and a continuous childhood abuse variable, which indicates that childhood abuse has a detrimental effect, independent of the frequency of events. In a previous paper we found comparable results (Wielaard et al., 2017), which might indicate that in older adults the presence of childhood abuse is more important than the frequency of abuse. However, a study in younger adults reported evidence for a dose-response relationship (Walker et al., 1999); meaning that a higher frequency of abuse increases the number of functional disabilities and health problems. This was also found for childhood abuse and the probability of lifetime depression (Kessler et al., 1997; Green et al., 2010; Nanni et al., 2012; Norman et al., 2012; Wiersma et al., 2015). So, it might be that childhood abuse makes people vulnerable for depression, health problems and functional disabilities, where later in life the frequency of abuse seems to become less important than the presence of abuse. However, it could also be that people with the highest frequency of childhood abuse did not participate in this study. It might also mean that later in life many different factors have a combined impact on functional disabilities in daily life since ageing is a complex, multivariable process.

Strength and limitations

Our study has several strengths and limitations. Major strengths of our study are the large sample size, and the availability of several meaningful mediating factors and relevant covariates that might confound the associations under study. In addition, childhood abuse was determined

using a questionnaire with more concrete and specific operationalisations per type of abuse, which is important in order to get a more veracious history on this sensitive topic (Hardt et al., 2006). Also, several limitations need to be considered. First, we used cross-sectional data, which means no causal inferences can be made. Second, due to the design of NESDO we retrospectively asked whether participants experienced some form of childhood abuse. This might have led to under- or overreporting (Fergusson et al., 2000) due to shame, unwillingness to tell about events, memory loss etc. Although opinions differ, it is most likely that people are underreporting (Fergusson et al., 2000) and even if results would be biased, false positives would be rare (Hardt & Rutter, 2004). In addition, only self-report measures of disability were used. An earlier study mentioned that some dimensions of the WHO DAS are somewhat overlapping with depressive symptomatology (Van der Werff et al., 2010) and used other measures for functional disability such as work absence. However, due to the age of our sample we could not add such measurements. Instead, we looked at the variation inflation factor between total score on the WHO DAS and depression severity, which was lower than 3 and indicated no multicollinearity. Furthermore, due to our statistical analyses, our data needed to be continuous and normally distributed. Although the total score of the WHO DAS and five out of six domains were normally distributed, domain 3 'self care' was not normally distributed. So, the results of this separate domain were not taken into account.

In late life, childhood abuse continues to have a large negative impact on daily life, which emphasizes the importance of clinical awareness. Our results suggest that it is important to screen for the occurrence of childhood abuse and integrate this in treatment for current psychopathology. In addition, since the association was explained by depressive symptoms, age at depression onset and number of chronic diseases, it seems worthwhile to take depression characteristics and chronic diseases into consideration, in order to reduce functional disabilities.

References

Afifi, T. O., MacMillan, H. L., Boyle, M., Cheung, K., Taillieu, T., Turner, S., & Sareen, J. (2016). Child abuse and physical health in adulthood. *Health reports*, *27*(3), 10.

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C. H., Perry, B. D., ... & Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood. *European archives of psychiatry and clinical neuroscience*, *256*(3), 174-186.

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders-IV-TR. *Washington, DC: American Psychiatric Association*.

Babor, T. F., Kranzler, H. R., & Lauerman, R. J. (1989). Early detection of harmful alcohol consumption: comparison of clinical, laboratory, and self-report screening procedures. *Addictive behaviors*, *14*(2), 139-157.

Barile, J. P., Thompson, W. W., Zack, M. M., Krahn, G. L., Horner-Johnson, W., & Bowen, S. E. (2013). Multiple chronic medical conditions and health-related quality of life in older adults, 2004–2006. *Preventing chronic disease*, *10*.

Bell, J. A., Sabia, S., Singh-Manoux, A., Hamer, M., & Kivimäki, M. (2017). Healthy obesity and risk of accelerated functional decline and disability. *International Journal of Obesity*, *41*(6), 866.

Bernet, C. Z., & Stein, M. B. (1999). Relationship of childhood maltreatment to the onset and course of major depression in adulthood. *Depression and anxiety*, *9*(4), 169-174.

Braam, A. W., Prince, M. J., Beekman, A. T., Delespaul, P., Dewey, M. E., Geerlings, S. W., ... & Peres, K. (2005). Physical health and depressive symptoms in older Europeans: Results from EURODEP. *The British Journal of Psychiatry*, *187*(1), 35-42.

Brugha, T., Bebbington, P., Tennant, C., & Hurry, J. (1985). The List of Threatening Experiences: a subset of 12 life event categories with considerable long-term contextual threat. *Psychological medicine*, *15*(1), 189-194.

Chartier, M. J., Walker, J. R., & Naimark, B. (2007). Childhood abuse, adult health, and health care utilization: results from a representative community sample. *American journal of epidemiology*, *165*(9), 1031-1038.

Chen, C. M., Mullan, J., Su, Y. Y., Griffiths, D., Kreis, I. A., & Chiu, H. C. (2012). The Longitudinal Relationship Between Depressive Symptoms and Disability for Older Adults: A Population-Based Stud y. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, *67*(10), 1059-1067.

Chwastiak, L. A., & Von Korff, M. (2003). Disability in depression and back pain: evaluation of the World Health Organization Disability Assessment Schedule (WHO DAS II) in a primary care setting. *Journal of clinical epidemiology*, *56*(6), 507-514.

Comijs, H. C., van Marwijk, H. W., van der Mast, R. C., Naarding, P., Voshaar, R. C. O., Beekman, A. T., ... & Penninx, B. W. (2011). The Netherlands study of depression in older persons (NESDO); a prospective cohort study. *BMC Research Notes*, *4*(1), 524.

Comijs, H. C., van Exel, E., van der Mast, R. C., Paauw, A., Voshaar, R. O., & Stek, M. L. (2013). Childhood abuse in late-life depression. *Journal of affective disorders*, *147*(1), 241-246.

Cuijpers, P., Smit, F., Unger, F., Stikkelbroek, Y., ten Have, M., & de Graaf, R. (2011). The disease burden of childhood adversities in adults: a population-based study. *Child abuse & neglect*, *35*(11), 937-945.

Danese, A., & Tan, M. (2014). Childhood maltreatment and obesity: systematic review and meta-analysis. *Molecular psychiatry*, *19*(5), 544.

De Graaf, R., Bijl, R. V., ten Have, M., Beekman, A. T., & Vollebergh, W. A. (2004). Pathways to comorbidity: the transition of pure mood, anxiety and substance use disorders into comorbid conditions in a longitudinal population-based study. *Journal of Affective Disorders*, *82*(3), 461-467.

Draper, B., Pfaff, J. J., Pirkis, J., Snowdon, J., Lautenschlager, N. T., Wilson, I., ... & Depression and Early Prevention of Suicide in General Practice Study Group. (2008). Long-term effects of childhood abuse on the quality of life and health of older people: results from the Depression and Early Prevention of Suicide in General Practice Project. *Journal of the American Geriatrics Society*, *56*(2), 262-271.

Fergusson, D. M., Horwood, L. J., & Woodward, L. J. (2000). The stability of child abuse reports: a longitudinal study of the reporting behaviour of young adults. *Psychological medicine*, *30*(3), 529-544.

Fergusson, D. M., McLeod, G. F., & Horwood, L. J. (2013). Childhood sexual abuse and adult developmental outcomes: Findings from a 30-year longitudinal study in New Zealand. *Child abuse & neglect*, *37*(9), 664-674.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. *Journal of psychiatric research*, *12*(3), 189-198.

Green, J. G., McLaughlin, K. A., Berglund, P. A., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: associations with first onset of DSM-IV disorders. *Archives of general psychiatry*, *67*(2), 113-123.

Jacob, M. E., Yee, L. M., Diehr, P. H., Arnold, A. M., Thielke, S. M., Chaves, P. H., ... & Newman, A. B. (2016). Can a healthy lifestyle compress the disabled period in older adults?. *Journal of the American Geriatrics Society*, *64*(10), 1952-1961.

Jindai, K., Nielson, C. M., Vorderstrasse, B. A., & Quiñones, A. R. (2016). Peer Reviewed: Multimorbidity and Functional Limitations Among Adults 65 or Older, NHANES 2005–2012. *Preventing chronic disease*, *13*.

Hardt, J., & Rutter, M. (2004). Validity of adult retrospective reports of adverse childhood experiences: review of the evidence. *Journal of child psychology and psychiatry*, *45*(2), 260-273.

Hardt, J., Sidor, A., Bracko, M., & Egle, U. T. (2006). Reliability of retrospective assessments of childhood experiences in Germany. *The Journal of nervous and mental disease*, *194*(9), 676-683.

Hovens, J. G., Wiersma, J. E., Giltay, E. J., Van Oppen, P., Spinhoven, P., Penninx, B. W., & Zitman, F. G. (2010). Childhood life events and childhood trauma in adult patients with depressive, anxiety and comorbid disorders vs. controls. *Acta Psychiatrica Scandinavica*, *122*(1), 66-74.

Hovens, J. G., Giltay, E. J., Spinhoven, P., van Hemert, A. M., & Penninx, B. W. (2015). Impact of childhood life events and childhood trauma on the onset and recurrence of depressive and anxiety disorders. *J Clin Psychiatry*, *76*(7), 931-938.

Kessler, R. C. (1997). The effects of stressful life events on depression. *Annual review of psychology*, *48*(1), 191-214.

Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., ... & Benjet, C. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *The British Journal of Psychiatry*, *197*(5), 378-385.

Kriegsman, D. M., Penninx, B. W., Van Eijk, J. T. M., Boeke, A. J. P., & Deeg, D. J. (1996). Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly: a study on the accuracy of patients' self-reports and on determinants of inaccuracy. *Journal of clinical epidemiology*, *49*(12), 1407-1417.

Leserman, J., Drossman, D. A., Li, Z., Toomey, T. C., Nachman, G., & Glogau, L. (1996). Sexual and physical abuse history in gastroenterology practice: how types of abuse impact health status. *Psychosomatic medicine*, *58*(1), 4-15.

Midei, A. J., Matthews, K. A., Chang, Y. F., & Bromberger, J. T. (2013). Childhood physical abuse is associated with incident metabolic syndrome in mid-life women. *Health Psychology*, *32*(2), 121.

Nanni, V., Uher, R., & Danese, A. (2012). Childhood maltreatment predicts unfavorable course of illness and treatment outcome in depression: a meta-analysis. *American Journal of Psychiatry*, *169*(2), 141-151.

Nelson, J., Klumparendt, A., Doebler, P., & Ehring, T. (2016). Childhood maltreatment and characteristics of adult depression: meta-analysis. *The British Journal of Psychiatry, 210*(2), 96-104.

Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: a systematic review and meta-analysis. *PLoS medicine*, *9*(11), e1001349.

Ormel, J., Rijsdijk, F. V., Sullivan, M., Van Sonderen, E., & Kempen, G. I. (2002). Temporal and reciprocal relationship between IADL/ADL disability and depressive symptoms in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(4), P338-P347.

Patten, S. B., Wilkes, T. C. R., Williams, J. V. A., Lavorato, D. H., El-Guebaly, N., Wild, T. C., ... & Bulloch, A. G. M. (2016). Childhood adversity and subsequent mental health status in adulthood: screening for associations using two linked surveys. *Epidemiology and psychiatric sciences*, *25*(2), 160-170.

Penninx, B. W., Leveille, S., Ferrucci, L., van Eijk, J. T., & Guralnik, J. M. (1999). Exploring the effect of depression on physical disability: longitudinal evidence from the established populations for epidemiologic studies of the elderly. *American journal of public health*, *89*(9), 1346-1352.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, *40*(3), 879-891.

Rehkopf, D. H., Headen, I., Hubbard, A., Deardorff, J., Kesavan, Y., Cohen, A. K., ... & Abrams, B. (2016). Adverse childhood experiences and later life adult obesity and smoking in the United States. *Annals of epidemiology*, *26*(7), 488-492.

Rush, A. J., Gullion, C. M., Basco, M. R., Jarrett, R. B., & Trivedi, M. H. (1996). The inventory of depressive symptomatology (IDS): psychometric properties. *Psychological medicine*, *26*(3), 477-486.

Sachs-Ericsson, N., Cromer, K., Hernandez, A., & Kendall-Tackett, K. (2009). A review of childhood abuse, health, and pain-related problems: the role of psychiatric disorders and current life stress. *Journal of Trauma & Dissociation*, *10*(2), 170-188.

Talbot, N. L., Chapman, B., Conwell, Y., McCollumn, K., Franus, N., Cotescu, S., & Duberstein, P. R. (2009). Childhood sexual abuse is associated with physical illness burden and functioning in psychiatric patients 50 years of age and older. *Psychosomatic medicine*, *71*(4), 417.

Van der Werff, E., Verboom, C. E., Penninx, B. W. J. H., Nolen, W. A., & Ormel, J. (2010). Explaining heterogeneity in disability associated with current major depressive disorder: effects of illness characteristics and comorbid mental disorders. *Journal of affective disorders*, *127*(1), 203-210.

Verhaak, P. F. M., Dekker, J. H., De Waal, M. W. M., Van Marwijk, H. W. J., & Comijs, H. C. (2014). Depression, disability and somatic diseases among elderly. *Journal of affective disorders*, *167*, 187-191.

Walker, E. A., Gelfand, A., Katon, W. J., Koss, M. P., Von Korff, M., Bernstein, D., & Russo, J. (1999). Adult health status of women with histories of childhood abuse and neglect. *The American journal of medicine*, *107*(4), 332-339.

Wegman, H. L., & Stetler, C. (2009). A meta-analytic review of the effects of childhood abuse on medical outcomes in adulthood. *Psychosomatic medicine*, *71*(8), 805-812.

Wielaard, I., Comijs, H. C., Stek, M. L., & Rhebergen, D. (2017). Childhood abuse and the two-year course of late-life depression. *The American Journal of Geriatric Psychiatry*, *25*(6), 633-643.

Wiersma, D. (1996). Measuring social disabilities in mental health. In *Mental health outcome measures* (pp. 111-122). Springer, Berlin, Heidelberg.

Wiersma, J. E., Hovens, J. G., van Oppen, P., Giltay, E. J., van Schaik, D. J., Beekman, A. T., & Penninx, B. W. (2009). The importance of childhood trauma and childhood life events for chronicity of depression in adults. *Journal of clinical Psychiatry*, *70*(7), 983.

Wiersma, J. E. (2015). Childhood adversity and depression. *The Journal of clinical psychiatry*, *76*(7), e906.

Wittchen, H. U., Robins, L. N., Cottler, L. B., Sartorius, N., Burke, J. D., & Regier, D. (1991). Cross-cultural

feasibility, reliability and sources of variance of the Composite International Diagnostic Interview (CIDI). The Multicentre WHO/ADAMHA Field Trials. *The British Journal of Psychiatry*, *159*(5), 645-653.